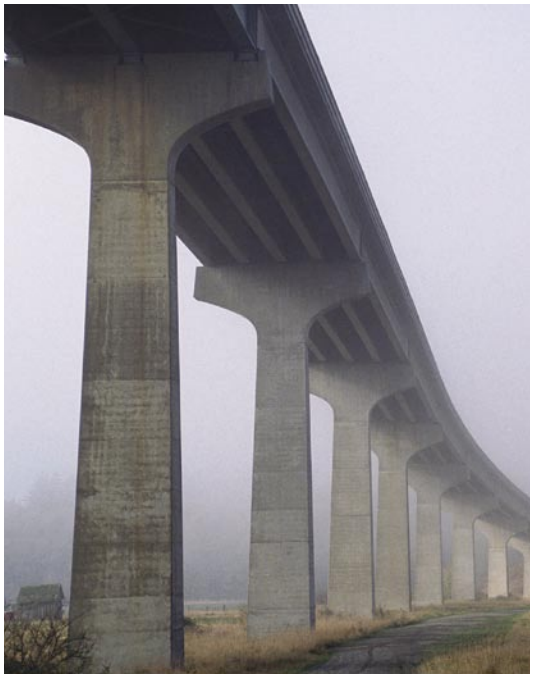
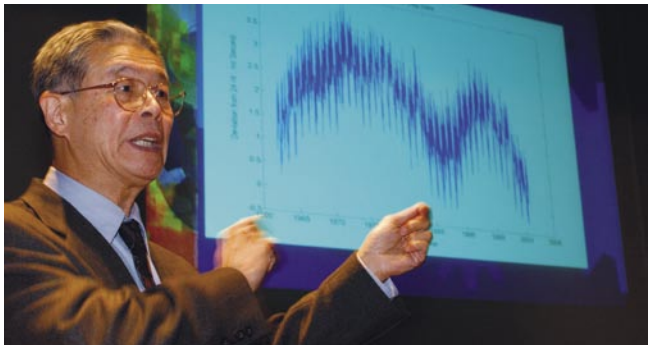
Goddard's HHT Helps Scientists Analyze Highway and Bridge Safety





A three-year agreement with Turner-Fairbank Highway Research Center (TFHRC) has enabled scientists to learn how to apply NASA Goddard Space Flight Center's Hilbert-Huang Transform (HHT) technology to analyses of traffic flow data, wind and traffic interaction with bridges, and damage detection in pavement and bridges. These analyses are the basis of TFHRC's Digital Highway Measurement (DHM) Project and are the first steps in a dramatic shift in the way state departments of transportation will be able to improve the safety and performance of the nation's highway infrastructure.

Benefits of Technology Transfer

- TFHRC gained the ability to measure highway design performance, rate of deterioration, and remaining life, helping to improve the performance of future highway and bridge construction.
- TFHRC is able to use its research findings to improve future highway safety and contribute to improved quality of life.
- The agreement enhanced NASA's strategic technology objectives, providing Goddard with the ability to make refinements to HHT technology.
- Stability analyses developed using HHT on vibration measurements at TFHRC are being used to benefit NASA research as well, particularly aero-elastic flight data at NASA Dryden Research Center.

tech transfer *success*

On the Record

"HHT has tremendously far-reaching applications. Goddard's work with TFHRC is just another example of how useful this technology can be to so many research fields." - *Monica Montague, Goddard Office of Technology Transfer (OTT)*

"By sharing the HHT technology with TFHRC, NASA will also benefit by using the resulting knowledge to refine and further develop HHT and its use in other areas of research."- *Norden Huang, inventor of HHT*

"The OTT was instrumental in enabling the transfer of HHT technology via conferences and direct communications with Dr. Norden E. Huang. This communication link insured we got things correctly applied on our first try, and thus provided more time to focus on extracting important research information that HHT revealed." - *Dr. Morton Oskard, Turner-Fairbank Highway Research Center*

"The HHT has been a critical element for accurate analysis of data from some of the sensors on board the DHM van. The capability being created in the van represents the beginning of a paradigm shift in the way states will view and be able to carryout their stewardship of the nation's highway infrastructure." - *Dr. Morton Oskard*

About Turner-Fairbank Highway Research Center

As part of the Federal Highway Administration based in McLean, VA, TFHRC conducts research and development related to new highway technologies for the world highway community. TFHRC's research provides solutions to complex technical problems to enhance the safety and reliability of the U.S. highway transportation system.

Technology Origins

A revolutionary, adaptive set of signal-analysis algorithms, HHT was developed as a part of NASA's oceonography research and was later applied to analysis of wing-flutter tests and the next generation of aircraft design at NASA Dryden Flight Center. The technology has also contributed to Shuttle mission safety by testing the tiles that insulate the Shuttle in space for the Shuttle Return to Flight Project following the Columbia accident.

Finding a New Use

Dr. Norden Huang began developing HHT in 1995. Unlike precursor technologies, HHT provides an effective method for analyzing nonlinear and nonstationary signals while improving the accuracy of linear- and stationary-signal analysis. Because analytical measurements within many areas of science benefit from a quantitative measurement of nonlinear data, HHT is widely applicable to a broad range of fields, including medicine, electronics, the environment, and business. HHT is ideal for structural engineering analyses at TFHRC.

The Transfer Process

Signed on January 17, 2003, the Space Act Agreement (SAA) between TFHRC and Goddard was negotiated and administered by the Office of Technology Transfer. Initial contact was made at a seminar attended by Dr. Huang. Officials from TFHRC began discussions with Huang about the potential use of HHT in highway research, leading to a formal agreement. During the course of the three-year agreement, TFHRC scientists have collaborated directly with Dr. Huang to build an operational model of HHT for their own analyses and to build a knowledge base for using the HHT algorithms within their own staff, working toward the successful DHM project. The resulting DHM van collects and analyzes critical highway safety data, which can lead researchers to better bridge and highway safety, design and construction.

Looking Ahead

Having successfully built an internal research team skilled in HHT, TFHRC is interested in continuing research with Goddard to address other highway and safety areas. A new agreement may be considered for ongoing collaboration.

For More Information

If you would like additional information about Goddard's technology transfer opportunities, please contact:

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